Research on Nurse Staffing and Patient Outcomes

Sean Clarke, RN, PhD, CRNP, CS

Assistant Professor, School of Nursing

Associate Director, Center for Health Outcomes and Policy Research

Senior Fellow, Leonard Davis Institute of Health Economics

Research Associate, Population Studies Center

University of Pennsylvania

PJ Verhonick Research Course, San Antonio, TX

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Outline

- Background: Nurse staffing shortages in context
- Measuring nurse staffing and patient outcomes
- Staffing research at the University of Pennsylvania Center for Health Outcomes and Policy Research
- Other research studies
- Implications and future directions for this research

Measuring Nurse Staffing

Staffing

- Sources
  - Internal institutional data about unit and hospital staffing (assignment sheets, payroll, etc.)
  - Official statistics submitted to state regulation agencies & American Hospital Association: RNs, LPNs/RPNs/NAs, unlicensed personnel
  - Asking nurses about patient load on last shift

Types of Measures

- Staffing ratios
  - Nurses: patients
  - Hours of nursing care per patient day
  - RN FTEs: ADC (average daily census), RN FTEs: AADC (adjusted for outpatient volume and other factors)
- Skill mix
  - unlicensed: licensed personnel
  - LPNs: RNs
  - BSN or higher: all nursing staff

Issues in Measuring Staffing

- Specialty-specific or hospital-wide?
- Outpatient services? Long-term care staff? (when ratio denominator is inpatient volume or outcomes involve inpatient outcomes)
- Direct care providers or all nursing staff?
- Staffing models: Role of non-RN staff
- Experience of staff generally not considered
- Illness acuity/nursing care needs: The missing link

Measuring Hospital Outcomes

Patient Outcomes: Data Sources (1)

- [Direct observation of care]
- Hospital chart abstraction
  - Problems: Cost, consistency, availability of relevant data
- Incident report databases
  - Problems: For administrative purposes, access is usually an issue
- Discharge abstracts
  - Can calculate mortality, complications, failure-to-rescue, but reliability issues

Patient Outcomes: Data Sources (2)

- Surveys of patients
  - Satisfaction
  - Health status
- Surveys of providers
  - Ratings of quality of care
  - Reports of problems with quality of care

Patient Outcomes

Result from:

- Patient characteristics (age, sex, comorbidities, illness stage, etc.)

+

- Process of care
  - Characteristics of providers (individuals and institutions)

Patient Outcomes

Complication

- an adverse condition not present on admission
- occurrence may be heavily dependent on patient characteristics and less on provider actions

Mortality

- where is not an expected outcome, may be related to both patient and provider actions
- very accurately documented in large datasets

Failure to Rescue

- Deaths in patients who have complications
- Believed to be more closely associated with provider characteristics and less closely related to patient characteristics
- Reflects human and material resources to “save” patients with complications

Clarke & Aiken, 2003

Quality Ratings by Clinicians

- Subjective ratings: Individual differences in perceptions and evaluations
- Rating quality, frequency of accidents/errors
  - Who/what is the frame of reference? The nurse's experiences, occurrences in the unit, the hospital
  - Memorability/availability heuristic

Research at the University of Pennsylvania Center for Health Outcomes and Policy Research

Sites for International Study of Hospital Outcomes

- United States
  - University of Pennsylvania
- Ontario
  - University of Toronto
  - Mt. Sinai WHO Collaborating Centre
- British Columbia
  - University of British Columbia
- Alberta
  - University of Alberta
- Germany
  - Hannover Medical School
- England
  - London School of Hygiene and Tropical Medicine
- Scotland
  - Glasgow University
  - Nursing Initiative of Scotland
  - Scottish NHS

International Hospital Outcomes Consortium: Funding Sources

National Institute of Nursing Research, NIH

Alberta Heritage Foundation for Medical Research

The Nuffield Provincial Hospital Trust, London

The Commonwealth Fund

The Baxter Foundation

U.S. Agency for Healthcare Research and Quality

Rockefeller Foundation

University of Pennsylvania

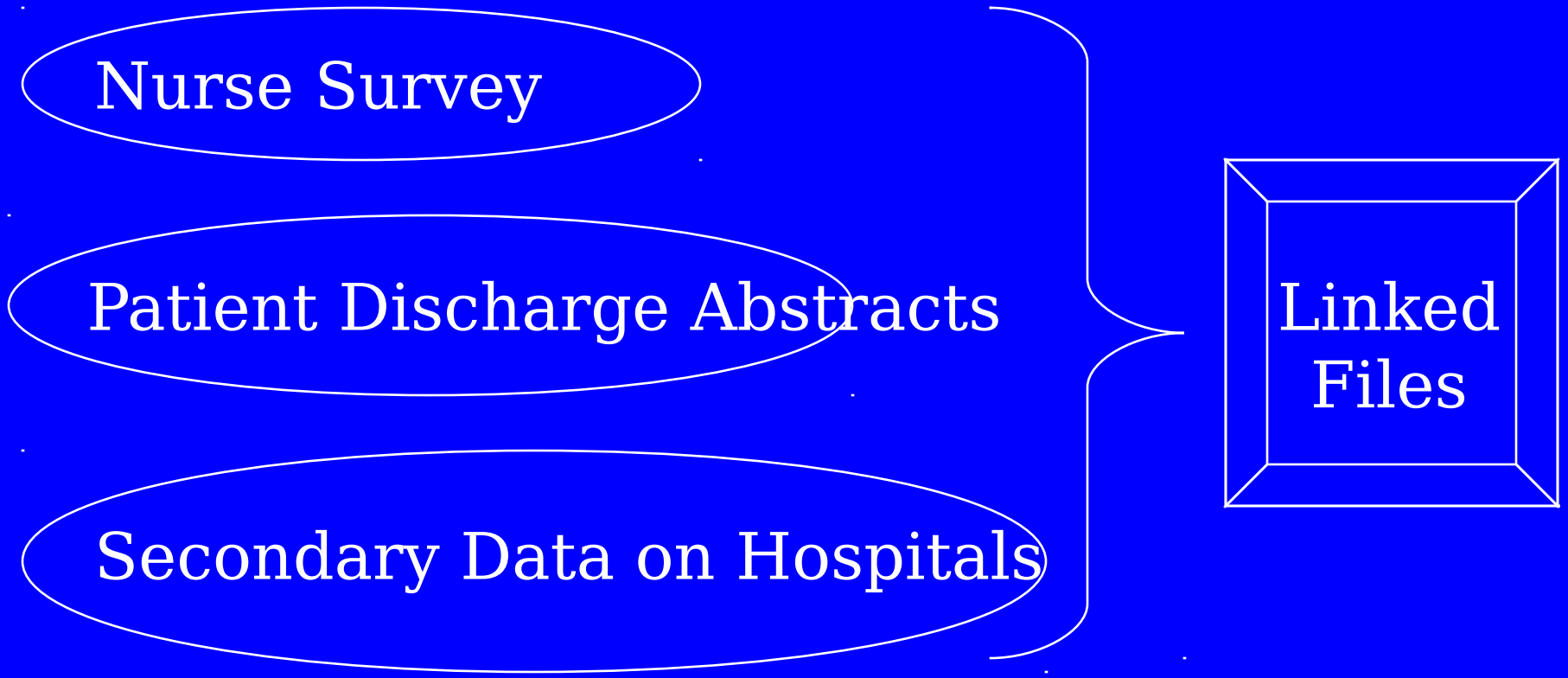
British Columbia Health Research Foundation

German Federal Ministry of Education, Science, Research and Technology

The International Study

- Goal: Create an institution-specific database on organizational attributes across jurisdictions
- Method:
  - Sample from RN licensure lists
  - Mail survey to RNs at home addresses
  - Ask for name of organization where employed
  - Aggregate responses to organization level

International Hospital Outcomes Study: Data Sources



The International Hospital Outcomes Study: Major Variables

Independent Variables

- Staffing (SURVEY, SECONDARY DATA)
- Organizational climate (SURVEY)

Dependent Variables

SURVEY

- nurse job satisfaction
- nurse burnout
- nurse-rated quality of patient care

PATIENT DISCHARGE ABSTRACTS

- 30-day mortality
- surgical failure-to-rescue

Hospital Nurse Staffing and Patient Mortality, Nurse Burnout, and Job Satisfaction

Linda H. Aiken, PhD, RN
Sean P. Clarke, PhD, RN
Douglas M. Sloane, PhD
Julie Sochalski, PhD, RN
Jeffrey H. Silber, MD, PhD

October 23/30, 2002. Journal of the American Medical Association, 288, 1987-1993
Funding Source : National Institute of Nursing Research, National Institutes of Health

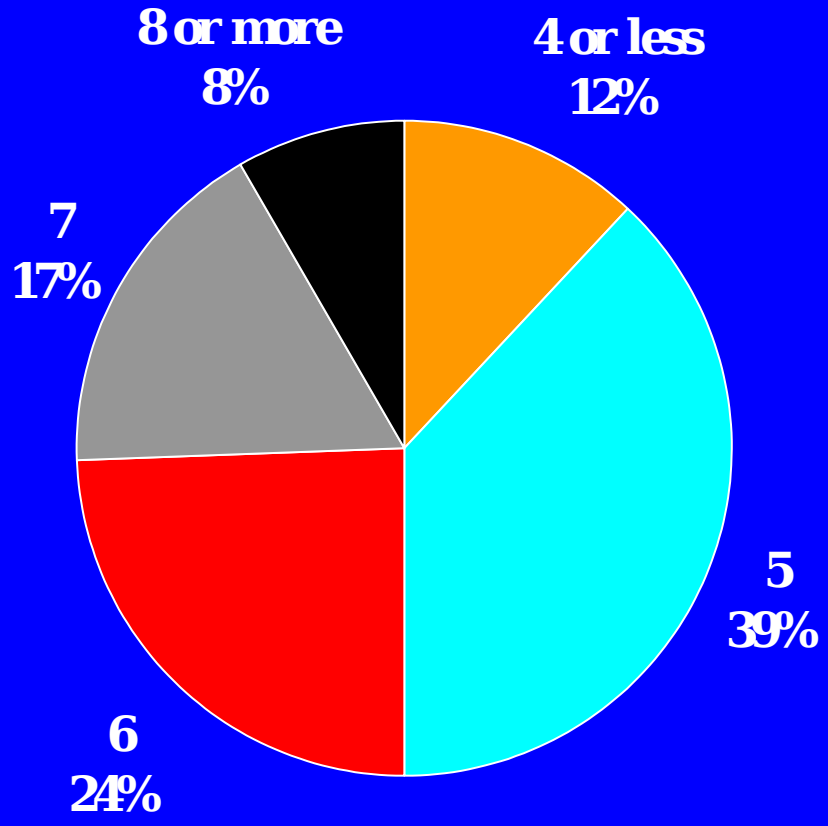
Selection Criteria

- between the ages of 20 and 85
- underwent general surgical, orthopedic, or vascular procedures

Outcomes in the 232,342 Surgical Patients

- 4,535 (2.0%) died within 30 days of admission
- 53,813 (23.2 %) were observed to experience a major complication
- the death rate among complicated patients (failure to rescue rate) was 8.4%

168 PA Hospitals: Average Patient Load Carried By Nurses on Last Shift Worked



Effect of Nurse Staffing on Mortality

- For every one patient-per-nurse increase in nursing workloads in PA hospitals: 14% increase in risk of death within 30 days for an individual patient
- After controlling for all the hospital and patient variables we have: 7% increase in risk of death

Other Key Results of the JAMA Paper

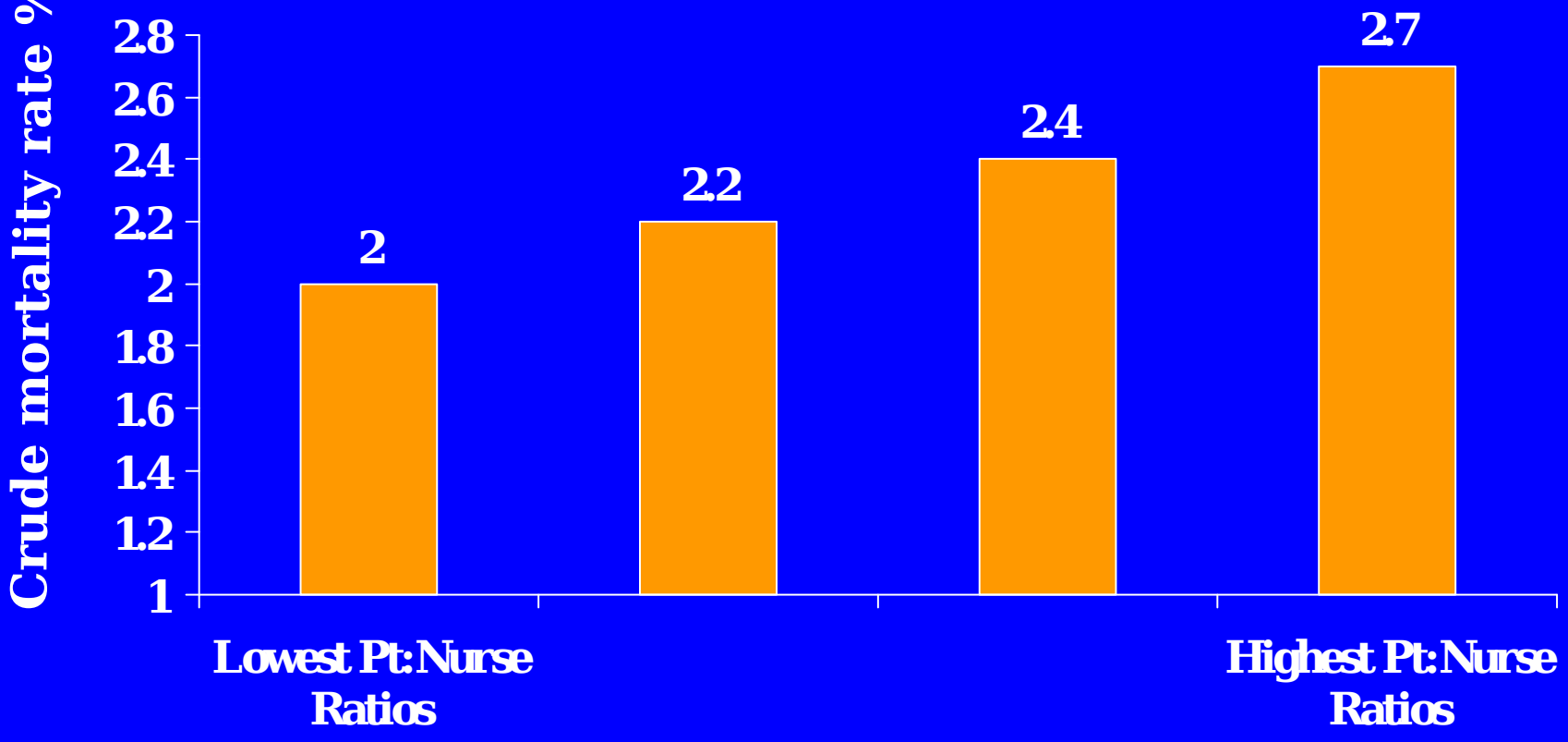
- A parallel increase of 7% in risk of death for patients with complications for every 1 patient per nurse increase in average workload in a hospital
- 23% and 15% increases in the risks of burnout and job dissatisfaction for nurses in hospitals for every additional patient per nurse (~11,000 nurses studied)

Translating the Results

- 5 per 1000 fewer surgical patients of the types studied expected to die in hospitals with 4:1 versus 8:1 average ratios
- ~ 4 M similar procedures/year in U.S. hospitals: if all patients treated in hospitals at 4:1 vs. 8:1 ratios … up to 20,000 fewer deaths

YOU DON'T LOOK SO GOOD... SHOULD I CALL THE NURSE?
I AM THE NURSE!
PATIENTS' HEALTH LINKED TO NURSES' WORKLOAD
NURSES' BACKBREAK
BEEP-BEEP-BEEP
JoeHeller

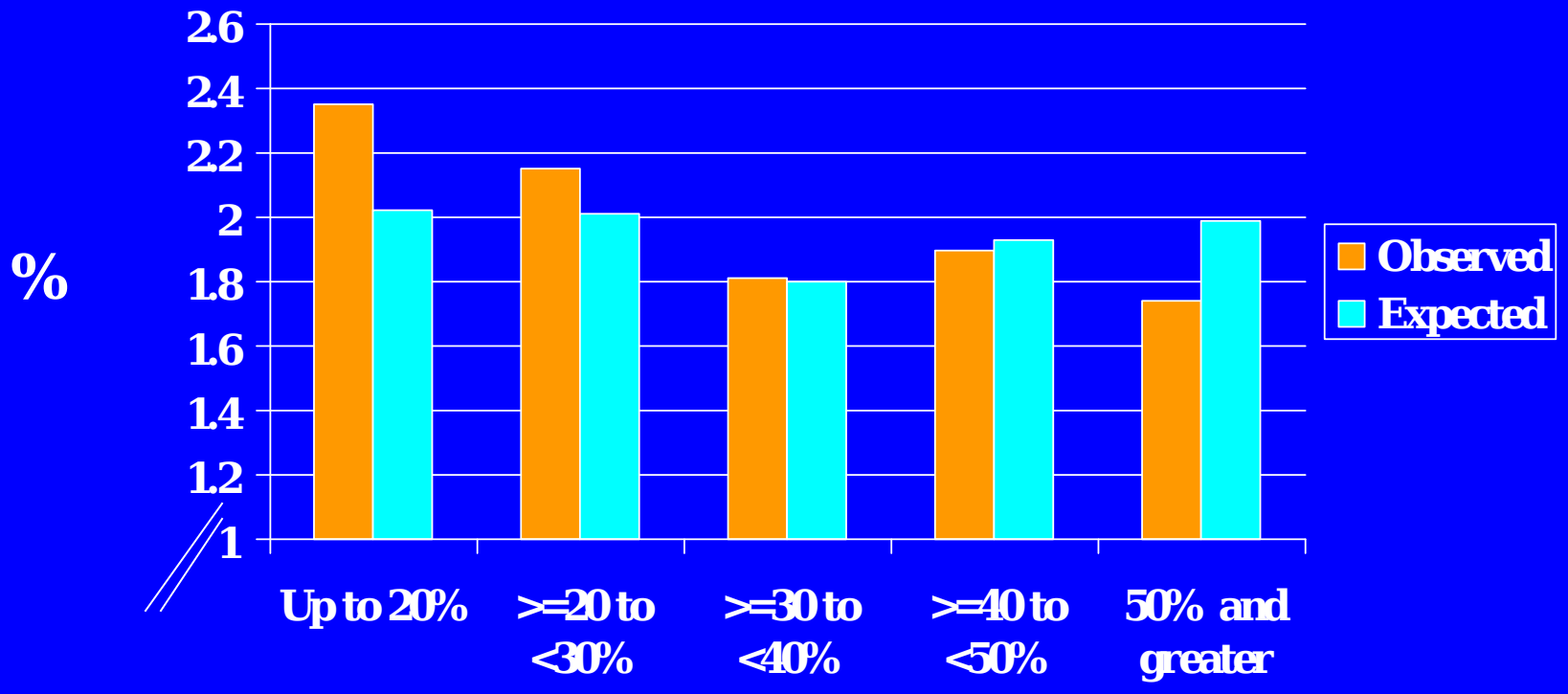
Inpatient Mortality Rates in 118,803 English Surgical Patients From 30 Trusts in Relation to Nurse Staffing Levels



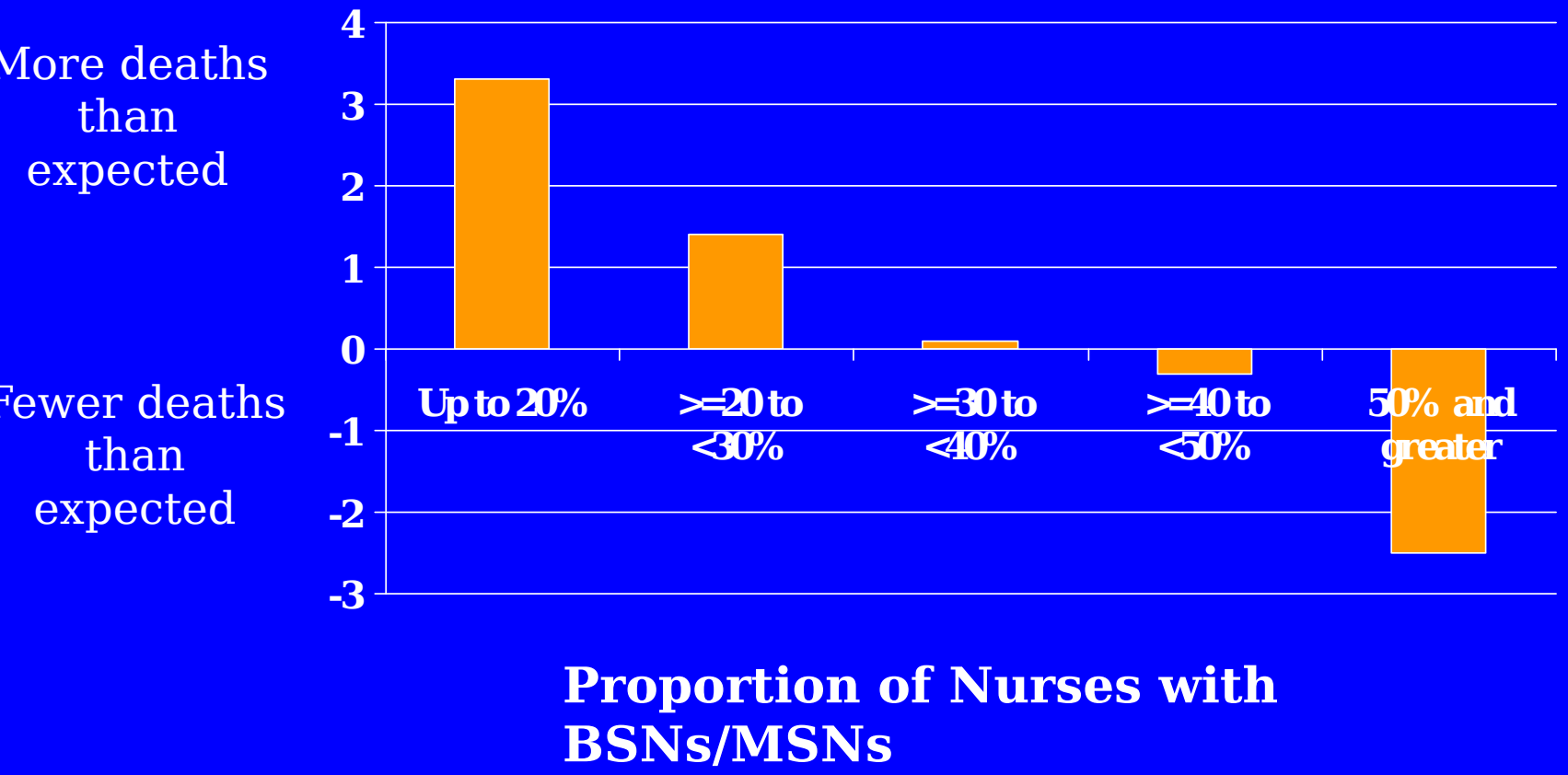
Education Levels of Hospital Nurses and Patient Mortality

- Aiken, Clarke, Cheung, Sloane, & Silber (September 24, 2003, Journal of the American Medical Association)
- The proportion of hospital staff RNs holding baccalaureate or higher degrees as their highest (not initial) credential ranged from 0 to 77% across the hospitals.

Surgical Mortality Rates Across PA Hospitals With Differing Proportions of BSN/MSN-Educated Nurses



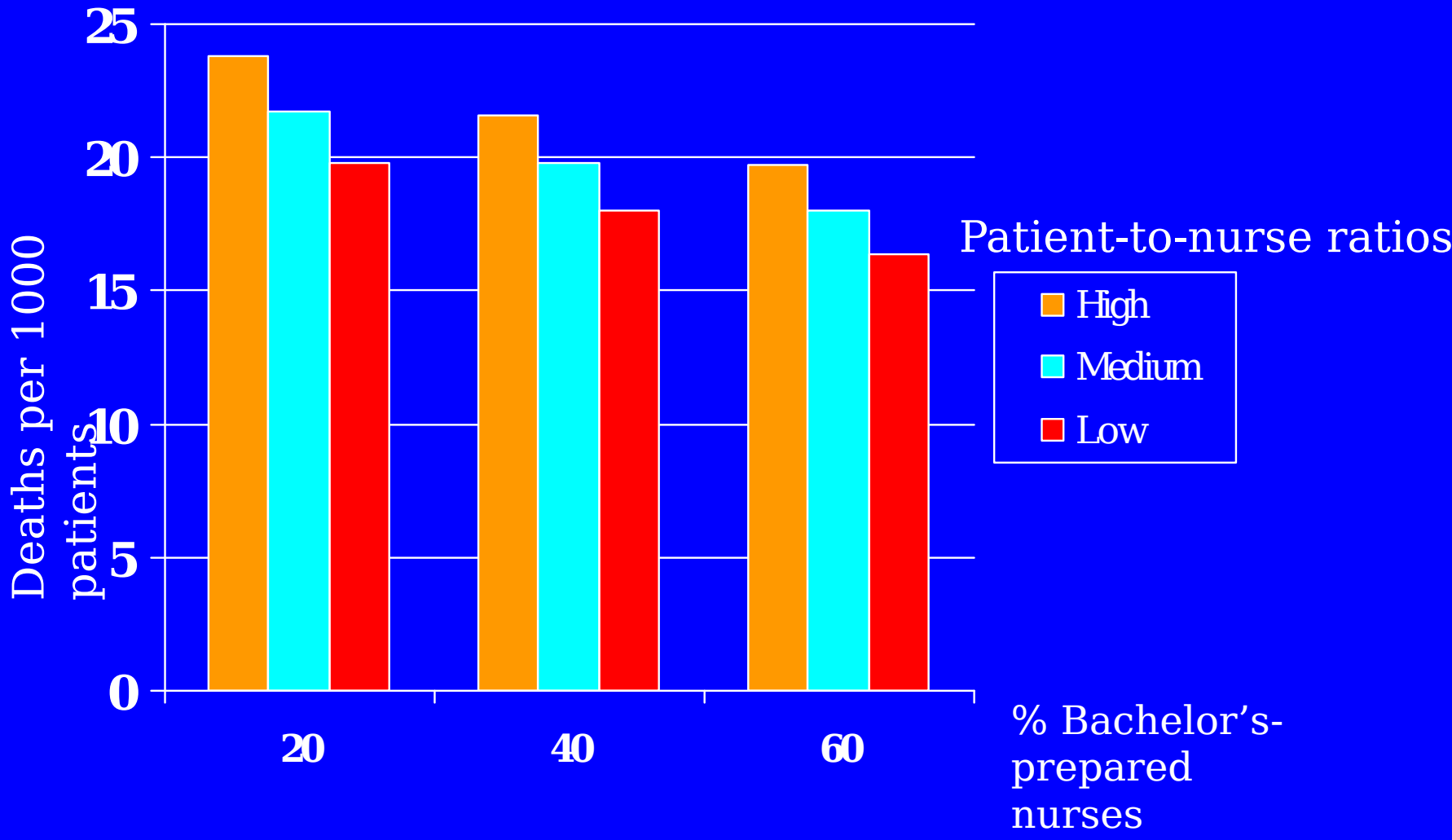
Excess Surgical Deaths (Observed-Expected) per 1000 Cases Across PA Hospitals With Differing Proportions of BSN/MSN-Educated Nurses



Odds Ratios for Patient Mortality (Fully-adjusted model)

Nurse education (10% increase in BSN+)	.95 (.91-.99)	p=.008
Nurse workload/staffing (1 pt per nurse increase)	1.06 (1.01-1.10) p=.02	
Nurse experience (per 1 year increase)	1.00 (.98-1.02)	p=.86
Board-certified surgeon	.85 (.73-.99)	p=.03

Patient deaths after surgery are lowest in hospitals where nurses care for fewer patients on average and have higher levels of education



Examples of Other Research

Relationship Between Nurse Staffing and Selected Adverse Events Following Surgery (Kovner & Gergen, 1998)

- Significant inverse relationship between RN staffing levels and the following postoperative complications:
  - urinary tract infections
  - pneumonia
  - thrombosis
  - pulmonary compromise
- Estimated that one additional RN hour per patient day was associated with a 9% decrease in UTI and 8% decrease in pneumonia
- Kovner et al. (2002)—only pneumonia associated with staffing

Blegen et al. (1998)

- Increasing a unit's total hours of care (RN, LPN, NA) is not associated with lower rates of adverse outcomes
- Increasing the proportion of RN hours of care is associated with lower rates of adverse outcomes:
  - medication errors
  - pressure ulcers
  - patient complaints
  - patient falls

American Nurses Association Sponsored Studies (1997, 2000)

- two major studies on the relationship between nurse staffing and patient outcomes “that [could] reasonably be theorized to be preventable in some patients by the amount and skill mix of nursing provided.” (ANA, 2000, p. vii)
- associations between higher staffing and higher proportions of RNs and better outcomes across 9 states:
  - shorter lengths of stay
  - lower risk of pressure ulcers
  - lower risk of pneumonia
  - lower risk of postoperative infections
  - lower risk of urinary tract infections

Needleman, Buerhaus, et al. (2001). Nurse Staffing and Patient Outcomes in Hospitals. (Report available at www.hrsa.gov/dn)

- Main analyses involved 1997 discharges from 799 hospitals across 11 states (AZ, CA, MA, MD, MI, NV, NY, SC, VA, WI, WV)
- the study found statistically significant relationships between nurse staffing variables and the following patient outcomes in acute care :
  - **Medical Patients:** urinary tract infection, pneumonia, shock, upper gastrointestinal bleeding, length of stay
  - **Patients Undergoing Major Surgery:** urinary tract infection, pneumonia, failure to rescue (defined as the death rate among patients with sepsis, pneumonia, shock, upper gastrointestinal bleeding, or deep vein thrombosis)

Needleman, Buerhaus, et al. (2001). Nurse Staffing and Patient Outcomes in Hospitals. (Report available at www.hrsa.gov/dn)

- high RN staffing associated with 3-12% decrease in likelihood of events, high total nursing staffing associated with 2-25% decrease
- no effects of staffing on mortality in either medical or surgical patients
- published in New England Journal of Medicine in May 2002

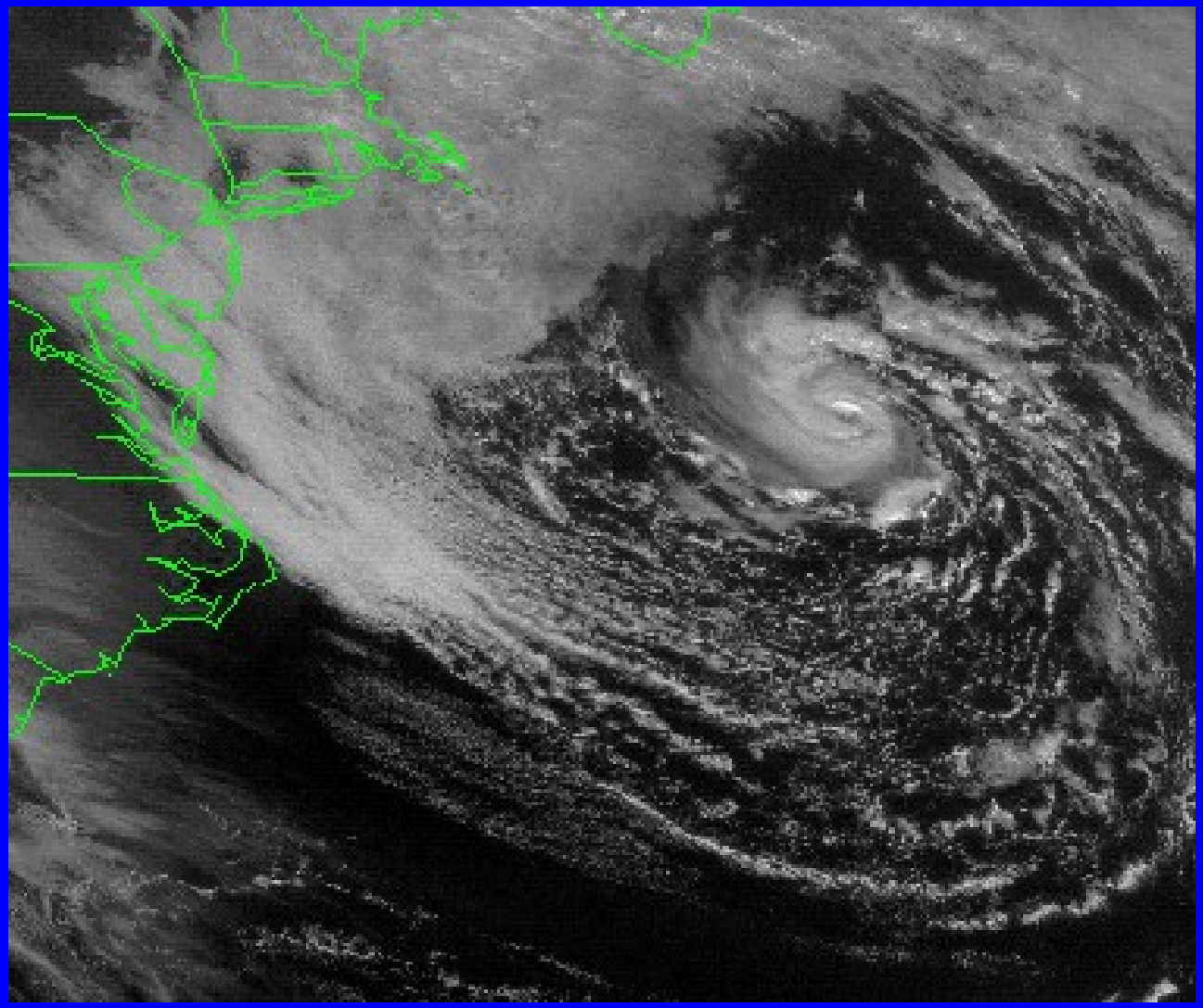
Examples of Other Recent Staffing Research

- Cho, S.-H., et al.: The effects of nurse staffing on adverse events, morbidity, mortality and medical costs. Nursing Research. 2003; 52(2): 71-79.
- McGillis Hall L et al. Nurse staffing models as predictors of patient outcomes. Med Care. 2003; 41(9):1096-1109.
- Person SD et al. Nurse staffing and mortality for Medicare patients with acute myocardial infarction. Medical Care. 2004; 42(1):4-12.
- Unruh L. Licensed nurse staffing and adverse events in hospitals. Med Care. 2003 Jan;41(1):142-52.

Summary

- Across a variety of study designs and clinical populations, low levels of nurse staffing and/or skill/education among nurses typically associated with increased rates of poor patient outcomes in inpatient care (complications, death, death following complications)
- Evidence grows, but patterns of results suggesting an influence of staffing are not always found … What determines whether or not an influence is detected?
- Possible mechanisms for the effect when it is found:
  - Omitted tasks (preventive measures)
  - Lower surveillance for patient problems
  - Decreased skill in carrying out tasks

Implications of the Research

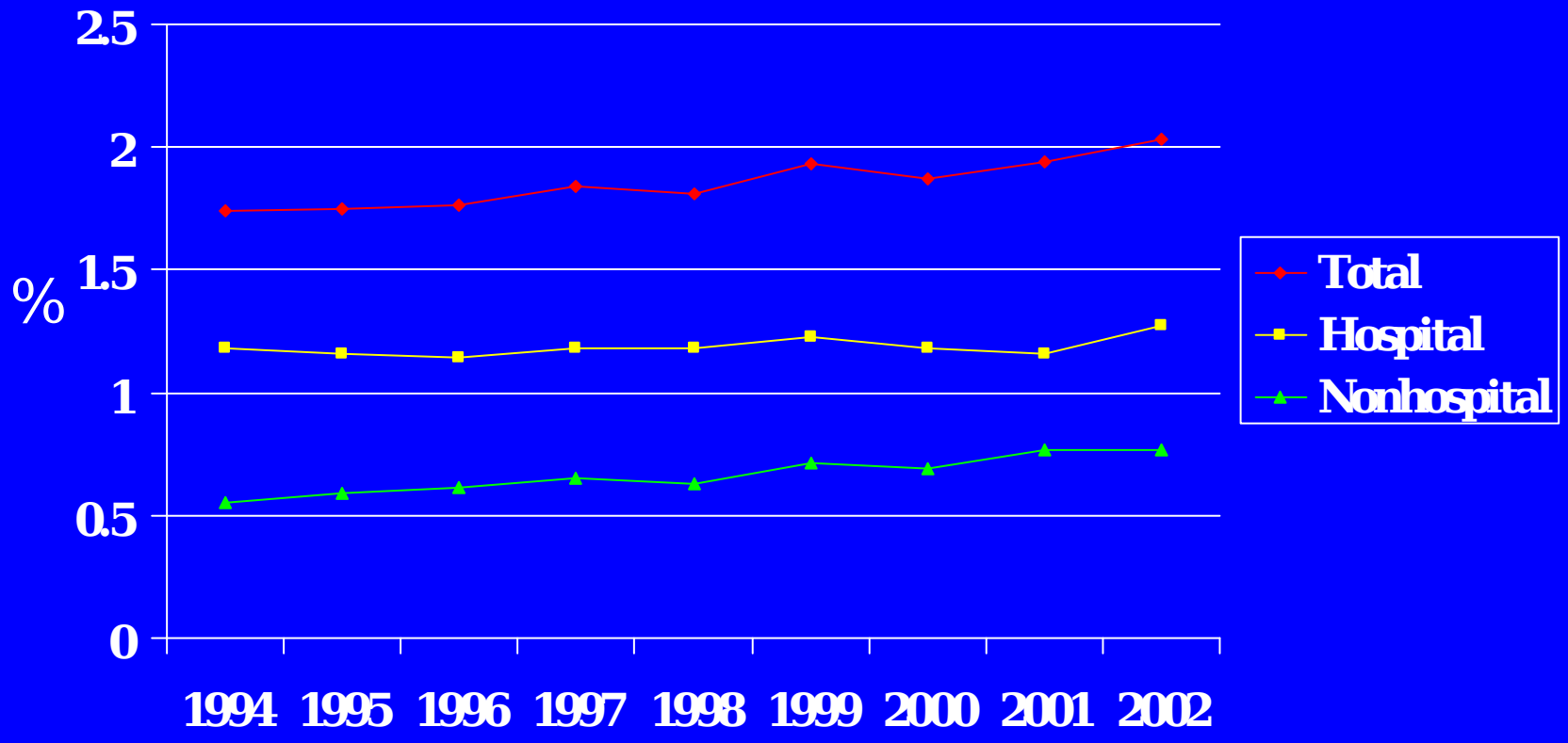


October 2001, NOAA Active Satellite Ar

The “Perfect Storm”

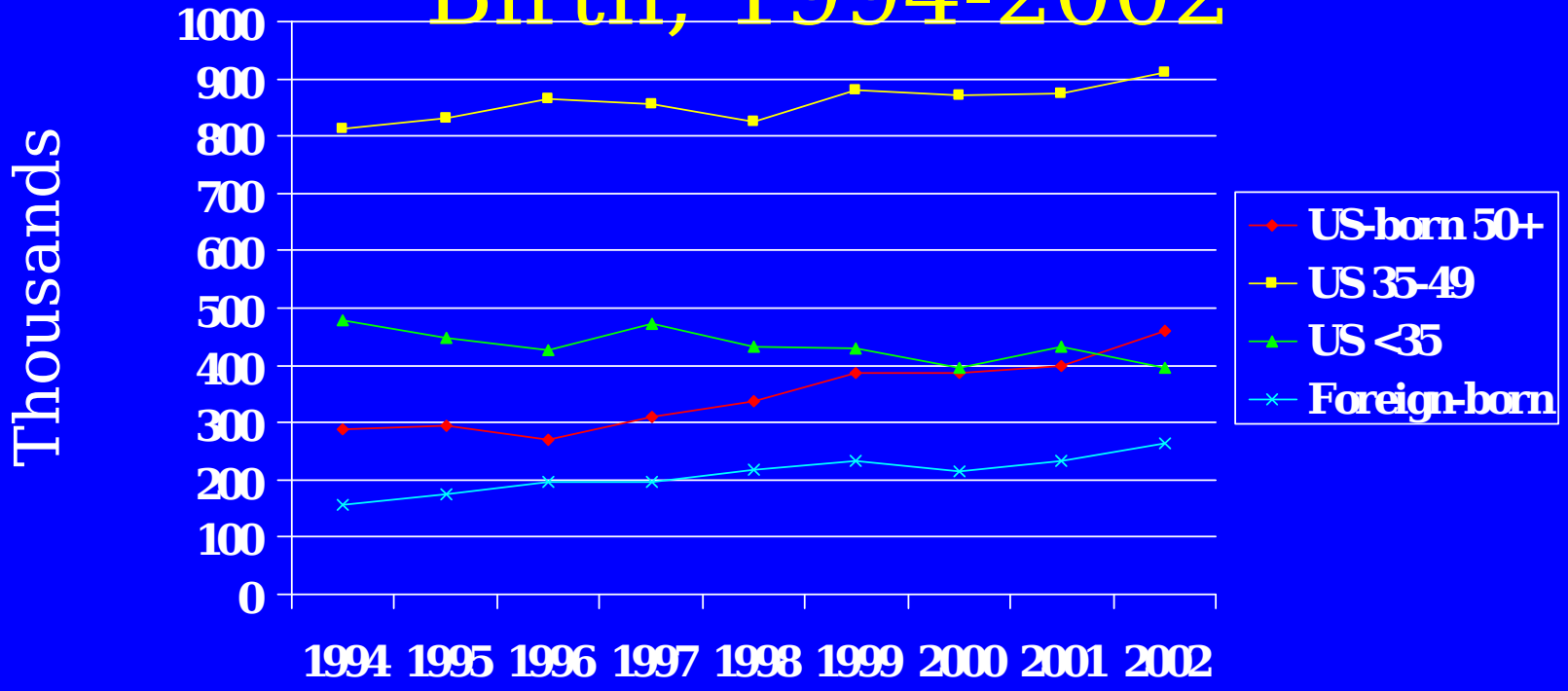
- Demographic trends in the profession
- Financial pressures within health care
- Demand for health care and demand for nursing services within the health care system

Employment Growth Among RNs, By Sector of Employment, 1994-2002



Buerhaus, Staiger & Auerbach,

FTE Employment of Registered Nurses By Age and Country of Birth, 1994-2002



Source: Buerhaus et al, 2003, Health Aff
US Bureau of the Census

Unanswered questions

- Staffing measurement systems that will indicate “safe” staffing in specific patient care situations
- Models of care involving LPNs and unlicensed personnel
- Experience, education and other nurse-specific factors
- Role of management and organizational characteristics
  - Aiken et al., 1994, 1999: lower risk-adjusted Medicare and AIDS mortality in reputational magnet hospitals

Issues for Clinicians and Managers (Clarke, Nursing Management, June 2003)

- Financial imperatives vs patient needs
- Burnout, job satisfaction issues in nursing staff: potential for vicious cycles
- Perceptions of staff and managers are the most important tool right now in evaluating the safety of staffing levels
- Legal liability issues
- Communicating staffing decisions to staff and patients/families

Two of the Major Policy Options for Dealing with Health Care Issues

- Providing incentives
  - Funding
  - Tax relief
- Regulation
  - Setting criteria for operation, licensure
  - Enforcement

Minimum Staffing Ratios: The Goals

- Proponents hope to alleviate some prominent concerns about patient safety
- Minimum staffing requirements will lead to more manageable workloads, improve nurse job satisfaction and retention and ameliorate the hospital nurse shortage

Minimum Staffing Ratios: Arguments Against

- A blunt policy tool with great potential for unintended consequences?
- Many hospitals are in areas where there may not be enough nurses to meet the goals: Then what?
- Rising costs of operating hospitals: What will happen to hospitals on the brink if nursing costs go up significantly?
- Will the minimum staffing ratios encourage hospitals that staff at higher levels to cut back to lower levels?
- Will non-nurse assistive personnel be cut back to economize, raising ratios but worsening workload?
- What if nurse staffing numbers *per se* are only part of the story?

Future Research Directions

- Explaining the mechanisms for associations—what happens at the bedside
- Cross-sectional research and its limitations: Need longitudinal research

"Without good and careful nursing many must suffer greatly, and probably perish, that might have been restored to health and comfort, and become useful to themselves, their families, and the public, for many years after."

– Benjamin Franklin (1751)